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The performance of a bio-nanomaterial essentially results from interactions that occur at its surface and that depend on the adsorption of biomolecules, particularly proteins. In order to improve the biocompatibility of nanomaterials, one of the challenges is to understand the mechanisms of protein adsorption and to appreciate the modifications of adsorbed proteins.
Using model hemoproteins and monodisperse silica nanoparticles (SiNPs) we studied the impact of the protein size on its ability to interact on the silica surface in a qualitative and quantitative way. Adsorption differences between myoglobin and hemoglobin (Devineau *et al.*, Langmuir, 2017) were previously investigated and we decided to extend the comparison to even larger hemoproteins that can be regarded as oligomeric hemoglobins. We studied the hemoprotein/SiNPs interactions using a panel of methods: adsorption isotherms, circular dichroism, small angle neutron scattering, and isothermal titration calorimetry. The end result of this study is that the protein size can have a major impact in terms of global affinity towards a silica surface but also in terms of protein structure alteration and thermodynamic changes caused by the adsorption.